Hydraulic and Seismic Properties of Methane-Bearing Coal

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In the last 10 years, coalbed methane (CBM) has transformed from being a coal mine hazard to a low-risk source of long term dry natural gas. The benefit of this clean burning natural gas as an energy source in conjunction with vast amounts stored in coal basins has led to the development of an industry that produces CBM. The attempt to reduce carbon emission in the atmosphere through CO_2 injection has added another benefit to the production of CMB, as CO_2 is used to dissolve methane from the coal seam. In order to successfully produce CBM, more information is needed on the migration of methane through fractures and cleats and on the replacement of methane by CO_2 in the coal seam. Laboratory experiments are currently performed to address these questions. Pressure tests on core samples are performed to determine the dissolution rates of CO_2 and methane in coal. Simultaneously experiments are conducted to estimate attributes of seismic waves in coal. The seismic measurements include P- and S-wave velocities as well as amplitudes of body waves, as a function of methane and CO_2 concentration in coal. The results can be used to design an experiment to monitor time-lapse changes and thus the production of gas from a coal seam during methane production.